Climate Change Planning in Alaska's National Parks

INTERIOR ARCTIC PARKS

PLENARY #1: PROJECT BACKGROUND AND SCENARIO PLANNING

Part I: General Background

BACKGROUND

ALASKA PARK MAP

KEY POINTS

SCENARIO PLANNING RATIONALE

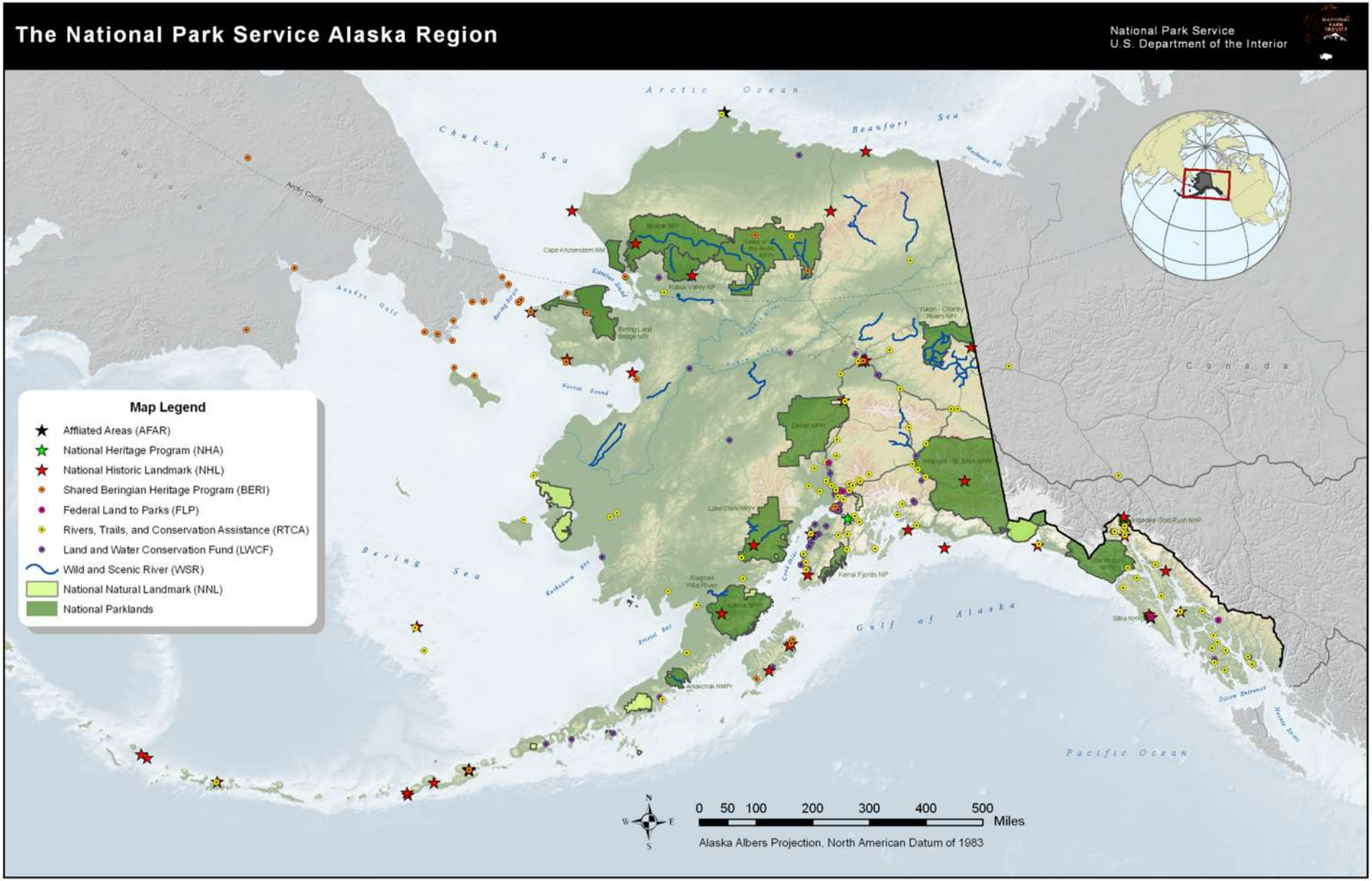
SNAP

(THE SCENARIOS NETWORK FOR ALASKA AND ARCTIC PLANNING)

ROLE

DATA

FOCAL PARKS


The National Park Service Alaska Region
National Park Service
U.S. Department of the Interior
Arctic Ocean
Chukchi Sea
Beaufort Sea
Bering Sea
Gulf of Alaska
Pacific Ocean
Canada
Russia
Arctic Circle
Map Legend
Affliated Areas (AFAR)
National Heritage Program (NHA)
National Historic Landmark (NHL)
Shared Beringian Heritage Program (BERI)
Federal Land to Parks (FLP)
Rivers, Trails, and Conservation Assistance (RTCA)
Land and Water Conservation Fund (LWCF)
Wild and Scenic River (WSR)
National Natural Landmark (NNL)
National Parklands
Cape Krusenstern NM
Kobuk Valley NP
Bering Land Bridge NPr
Noatak NPr
Gates of the Arctic NPPr
Yukon - Charley Rivers NPr
Denali NPPr
Lake Clark NPPr
Aniakchak NMPr
Katmai NPPr
Kenai Fjords NP
Klondike Gold Rush NHP
Sitka NHP
0 50 100 200 300 400 500
Miles
Alaska Albers Projection, North American Datum of 1983

Southeast Alaska Network Parks

Kobuk Valley National Park

Gates of the Arctic National Park and Preserve

Noatak National Preserve

Park Photos -- Focal Parks

Great Kobuk Sand Dunes
NPS photo

Gates of the Arctic National Park and Preserve
NPS photo

Noatak River
NPS photo

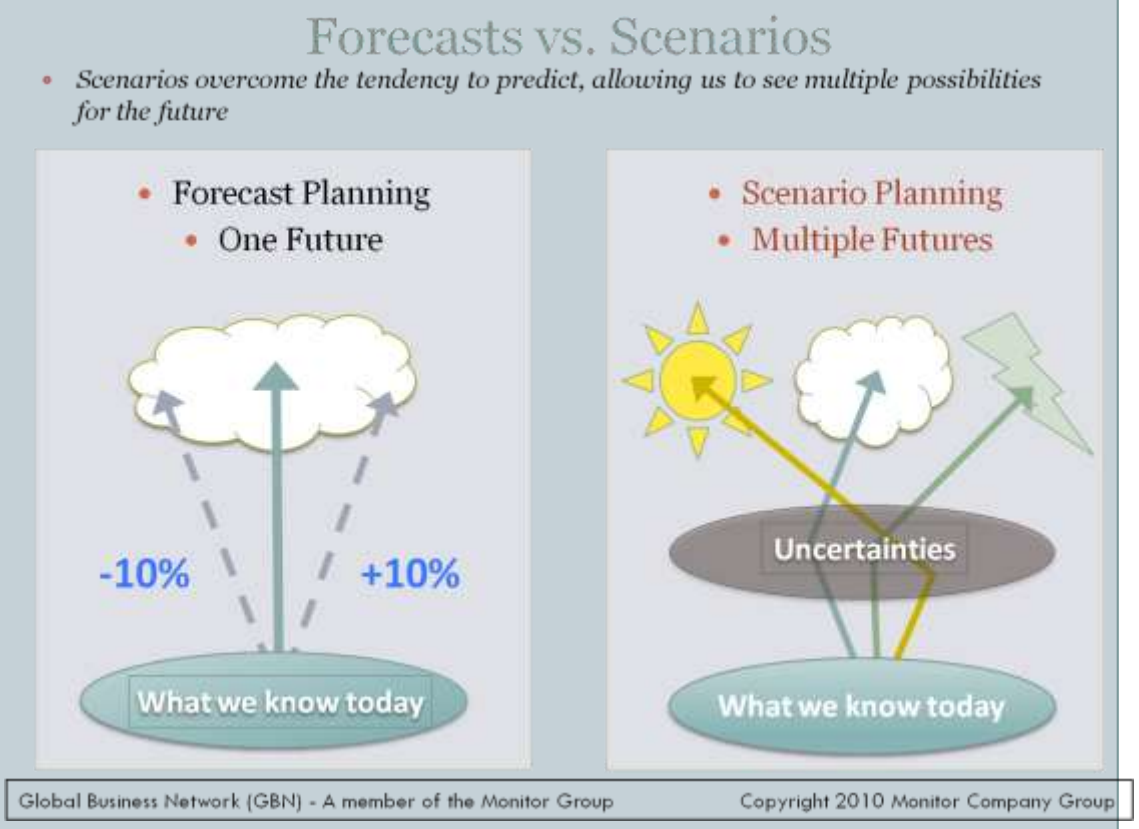
Key Points

- Alaska's National Parks comprise a large % of the state, across multiple ecosystems
- Climate change is already having profound social, economic, and ecological impacts statewide
- The future is uncertain
- Managing for the "status quo" is likely to backfire
- Looking only within designated land boundaries is unrealistic
- Collaboration and knowledge sharing is crucial

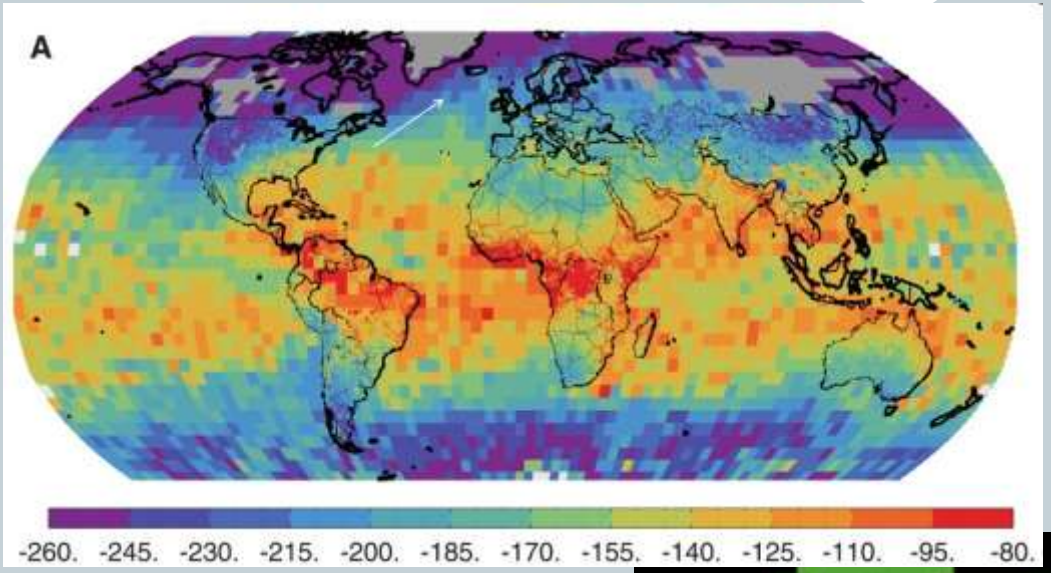
Why Scenario Planning?

- Scenario planning allows managers to address multiple possible futures that are:

  Relevant
  Divergent
  Challenging
  Plausible



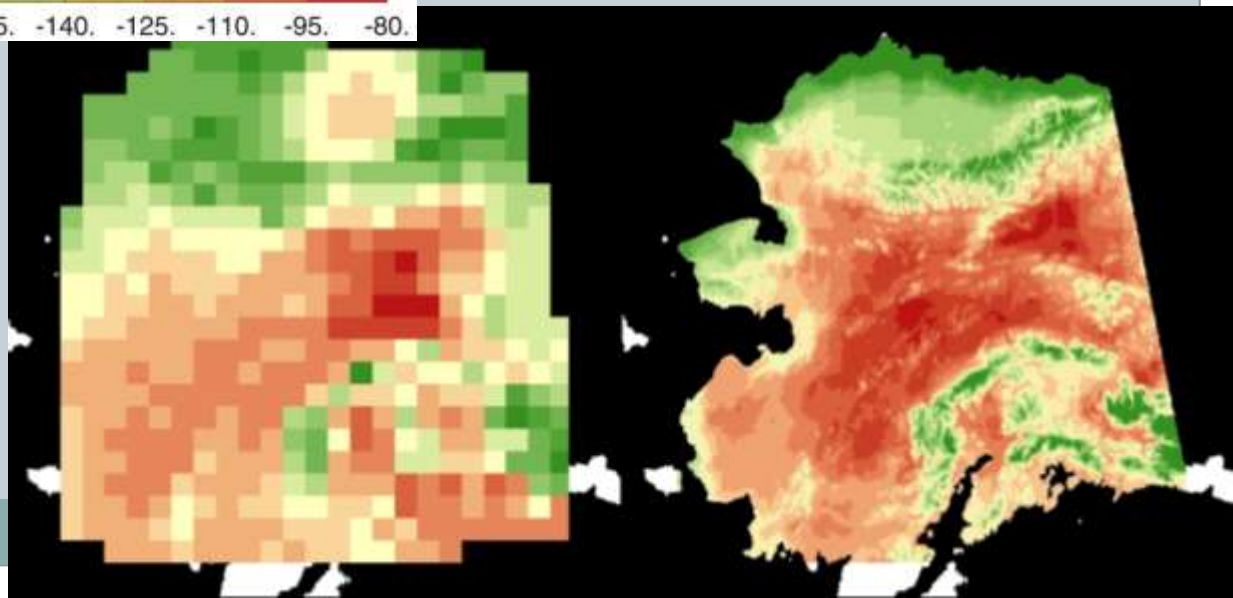
SNAP: Scenarios Network for Alaska and Arctic Planning



SNAP projections are based on 5 selected IPCC models, and downscaled using PRISM gridded data

GCM output (ECHAM5) *Figure 1A from Frankenberg st al., Science, Sept. 11, 2009*

CRU data and SNAP outputs after PRISM downscaling 0.5 x 0.5 degrees to 2 x 2 km



- **Temperature**
- **Precipitation (rain and snow)**
- **Every month of every year from 1900 to 2100 (historical + projected)**
- **5 models, 3 emission scenarios**

What is most important?

- What changes are most likely?
- What changes will have the greatest impact?
- What are we best able to predict?
- How can we adapt to those changes?

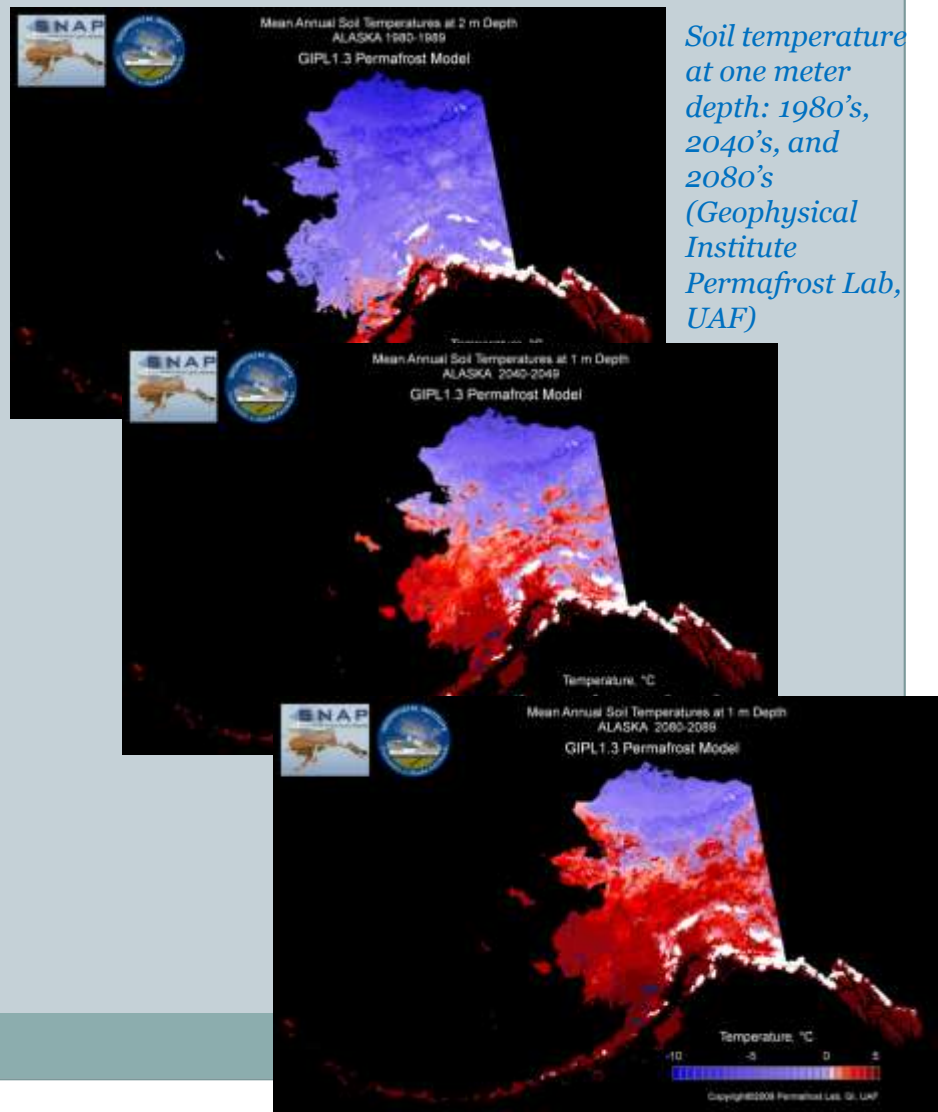
Scenarios Network
FOR ALASKA & ARCTIC PLANNING

www.snap.uaf.edu

What is SNAP's role?

Scenarios are linked to SNAP models

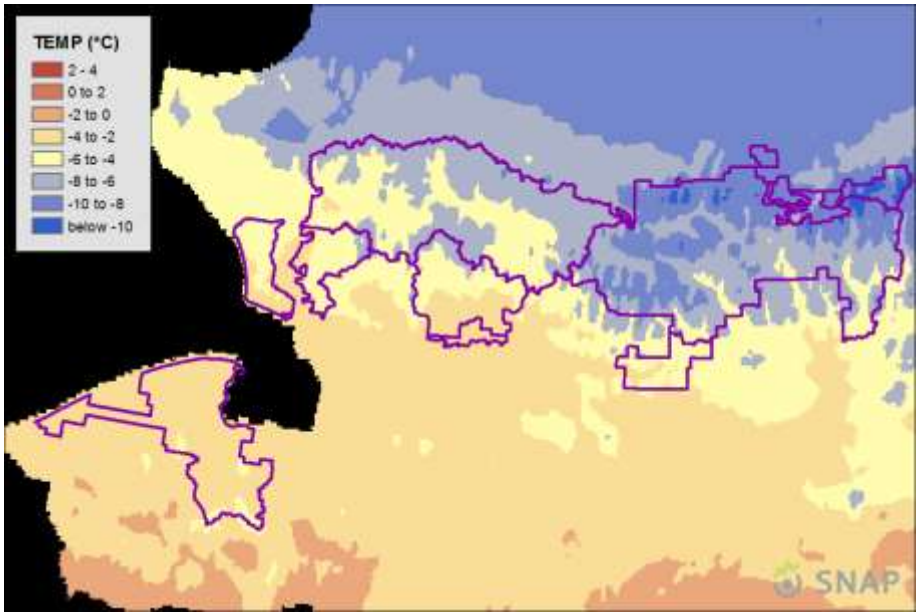
- Basic climate models
- Linked climate models
  - Season length
  - Shifting plants and animals (biomes and ecosystems)
  - Soil temperature and permafrost
  - Water availability
  - Forest fire
- Models of how people use land and resources
- Other models linked to climate and human behavior

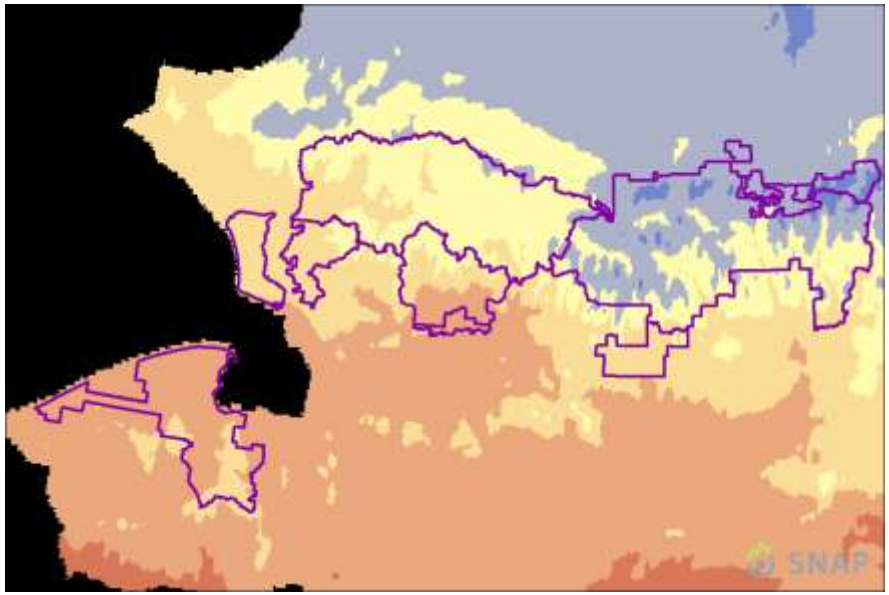


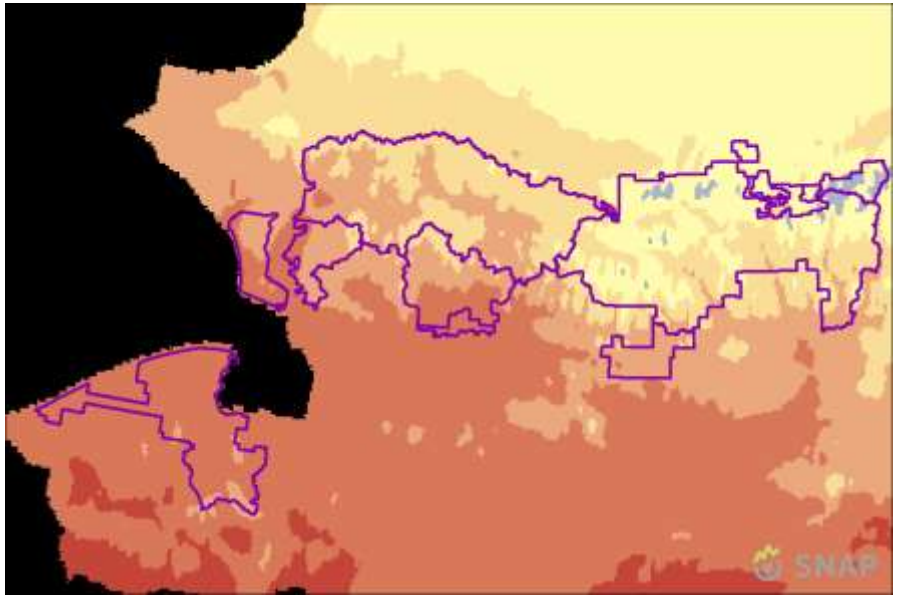
Soil temperature at one meter depth: 1980's, 2040's, and 2080's (Geophysical Institute Permafrost Lab, UAF)

Central Arctic Annual Temperature Projections 2030's, 2060's, 2090's

5-model average, A1B scenario

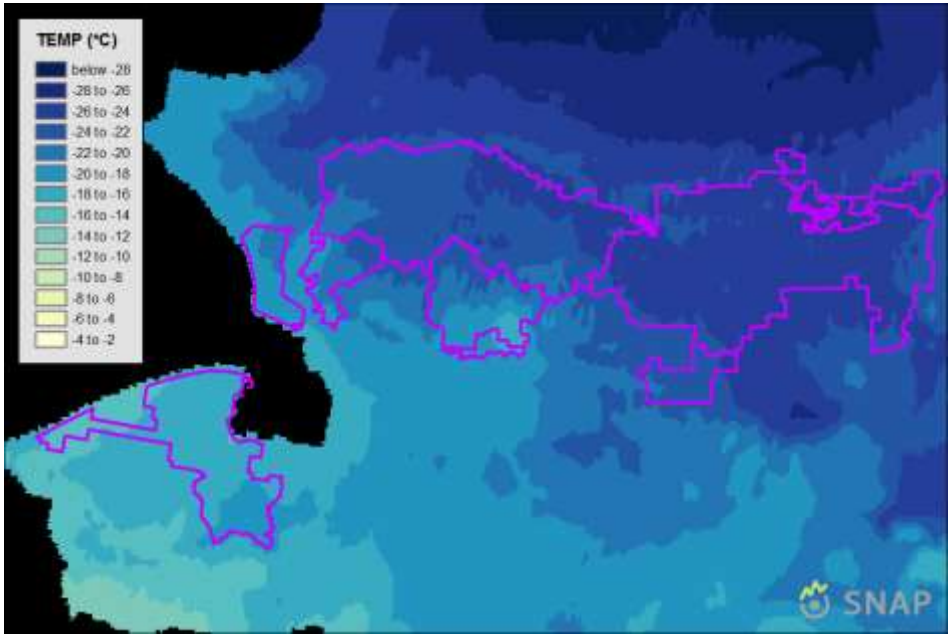


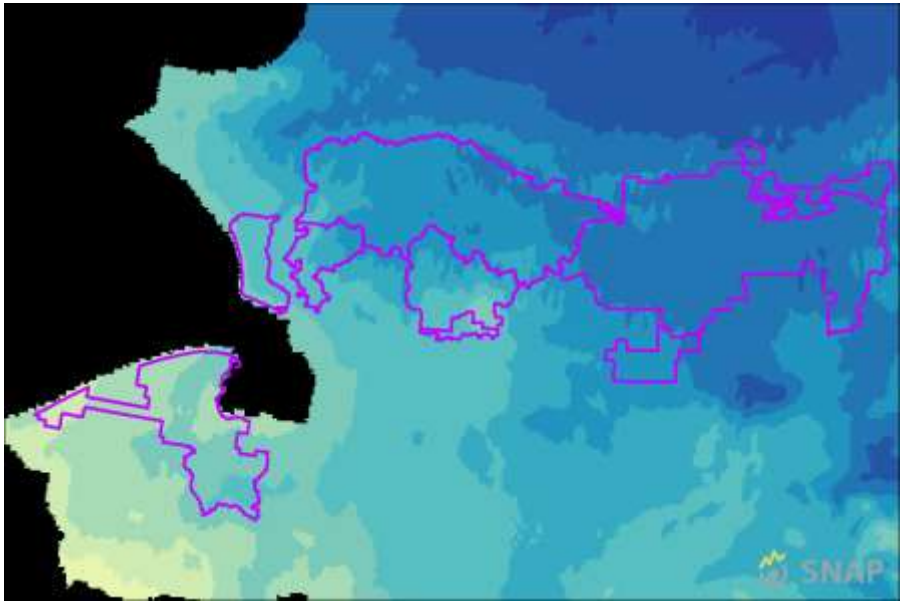


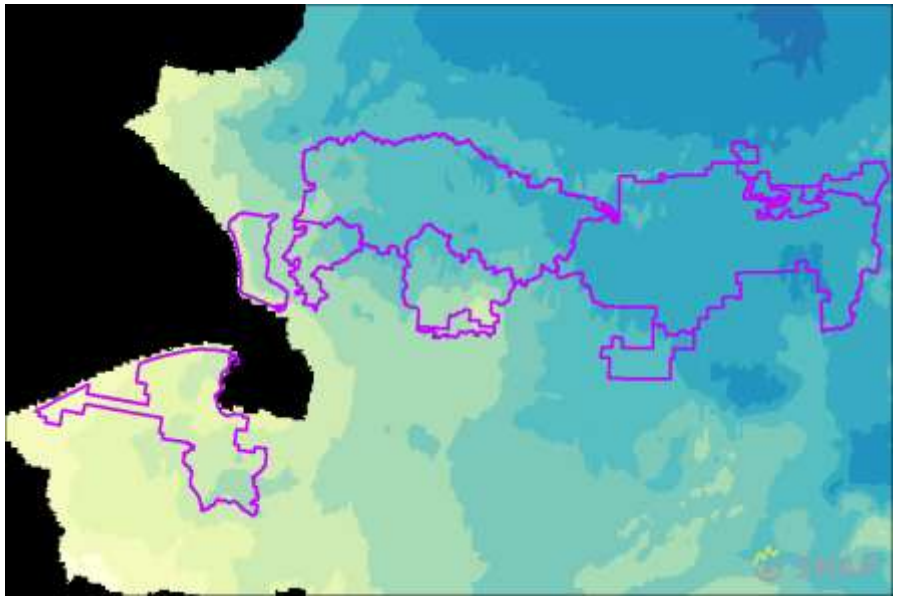


Central Arctic Winter Temperature Projections 2010's, 2050's, 2090's

5-model average, A1B scenario

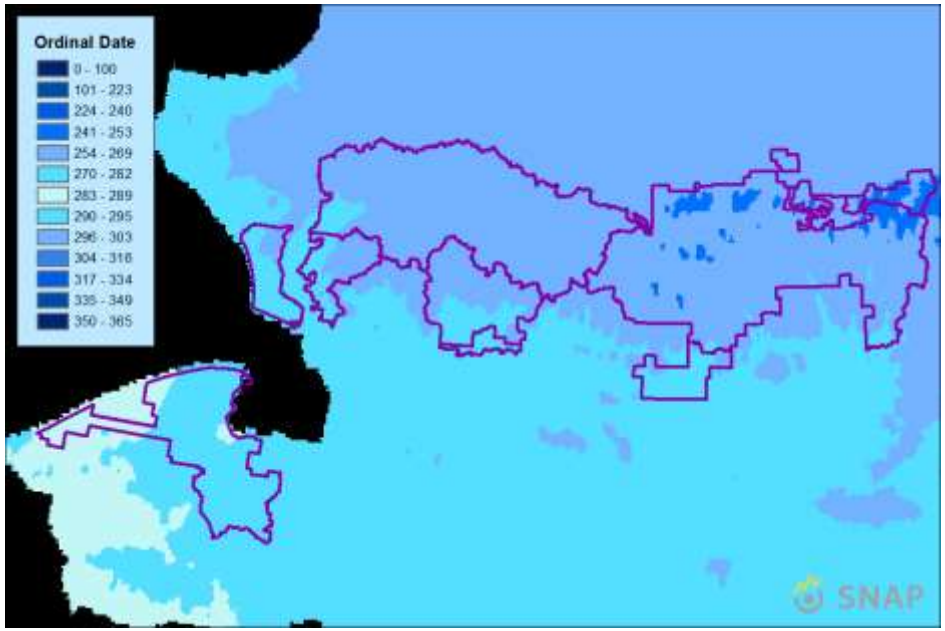


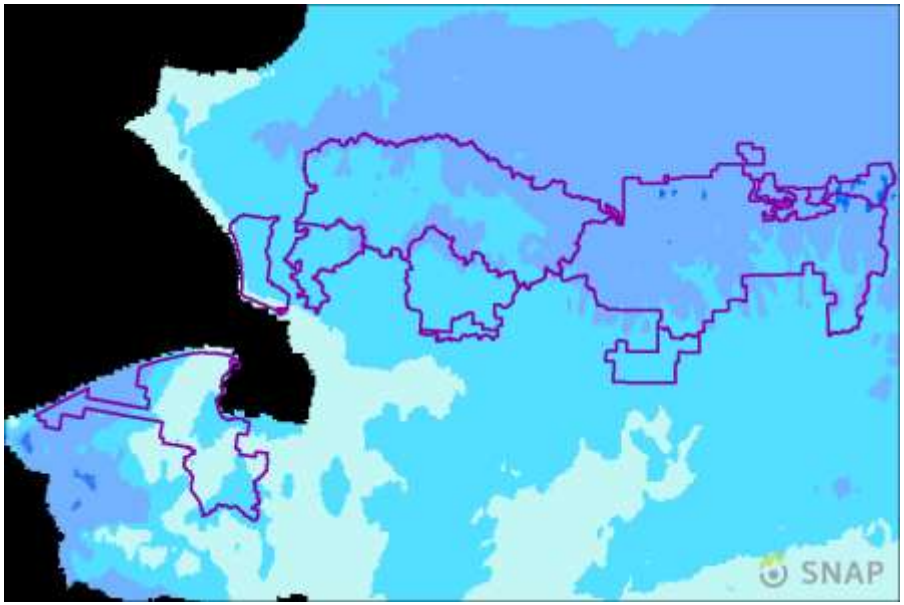


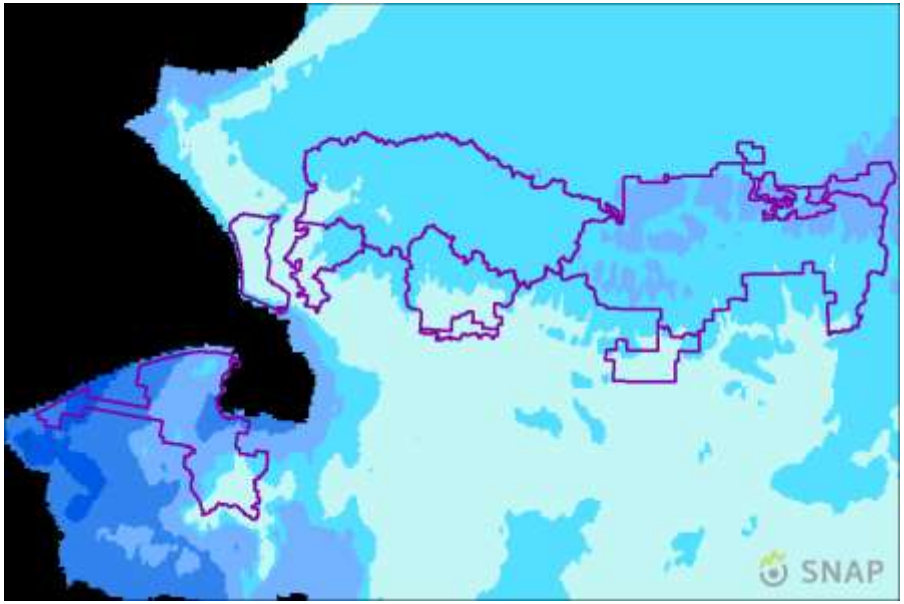


Central Arctic Date of Freeze Projections 2010's, 2050's, 2090's

5-model average, A1B scenario

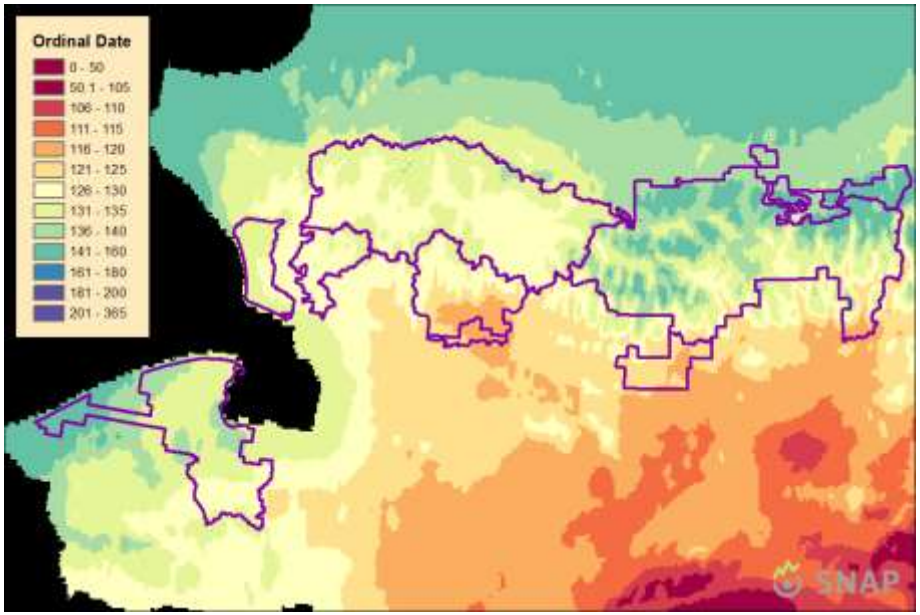


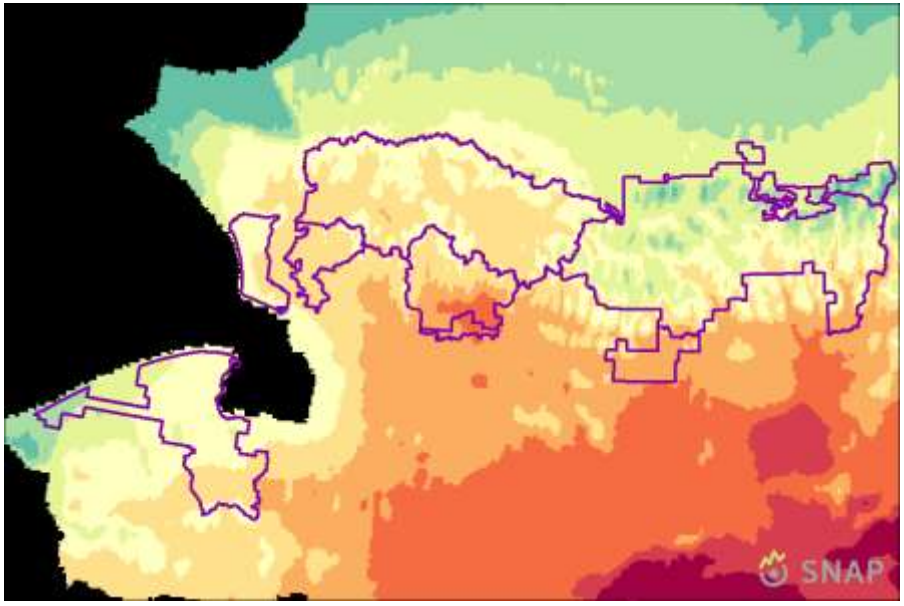


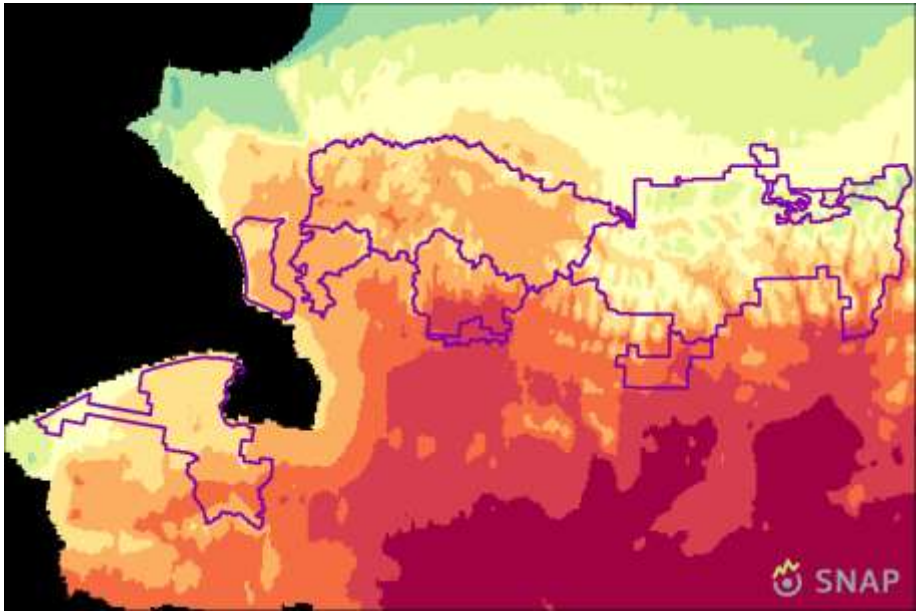


Central Arctic Date of Thaw Projections 2010's, 2050's, 2090's

5-model average, A1B scenario

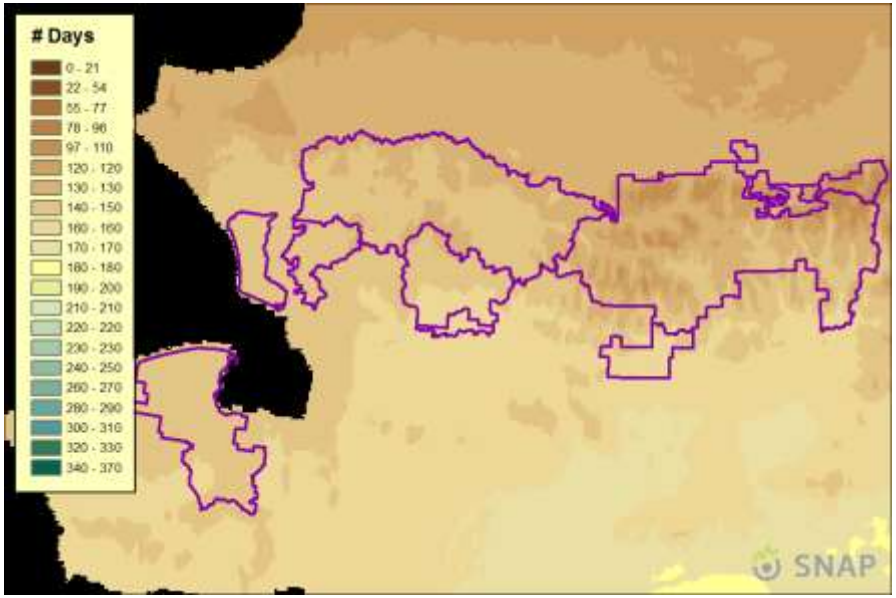


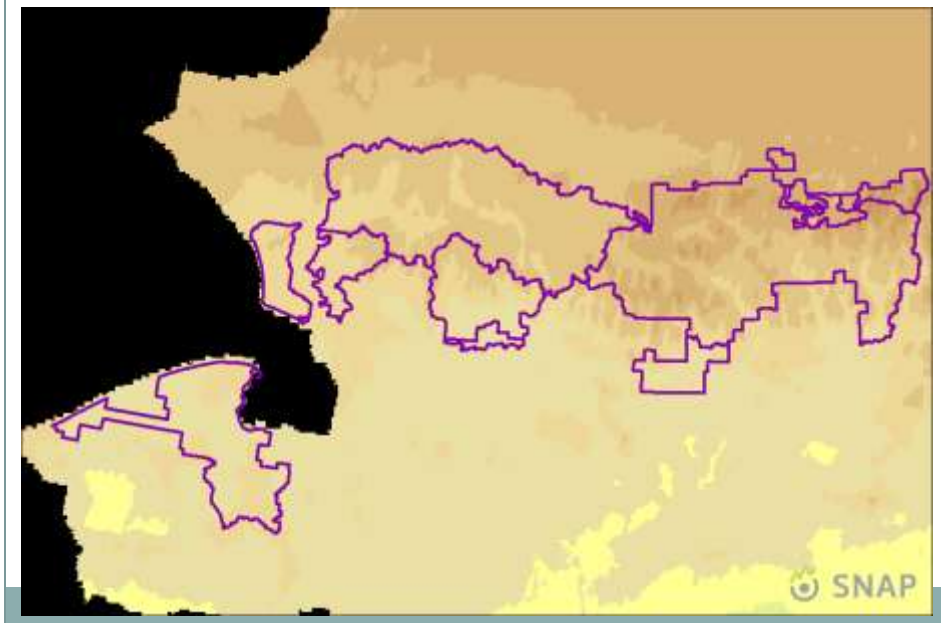


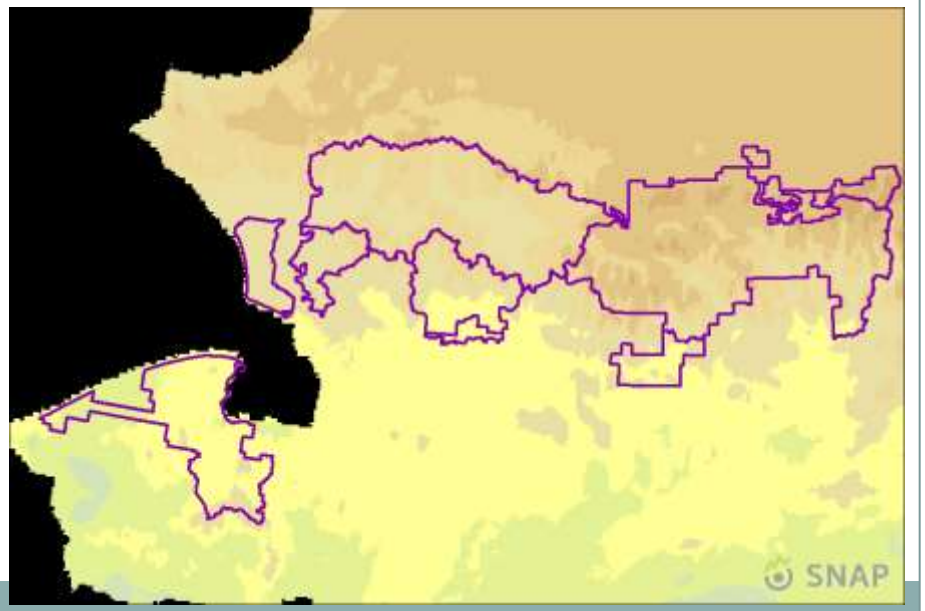


Central Arctic Length of Growing Season Projections 2010's, 2050's, 2090's

5-model average, A1B scenario







Other Resources

- Fellow participants and other presenters
- Reading suggestions: Art of the Long View, Beyond Naturalness
- Fact sheets – PDO, Ocean acidification, SNAP methods
- NPS Talking Points: Alaska Boreal and Arctic
  - regional section that provides information on changes, organized around seven types of impacts
  - section outlining No Regrets Actions that can be taken now to mitigate and adapt to climate changes
  - general section on Global Climate Change arranged around four topics

Access these and other documents at http://www.snap.uaf.edu/webshared/Nancy%20Fresco/NPS/

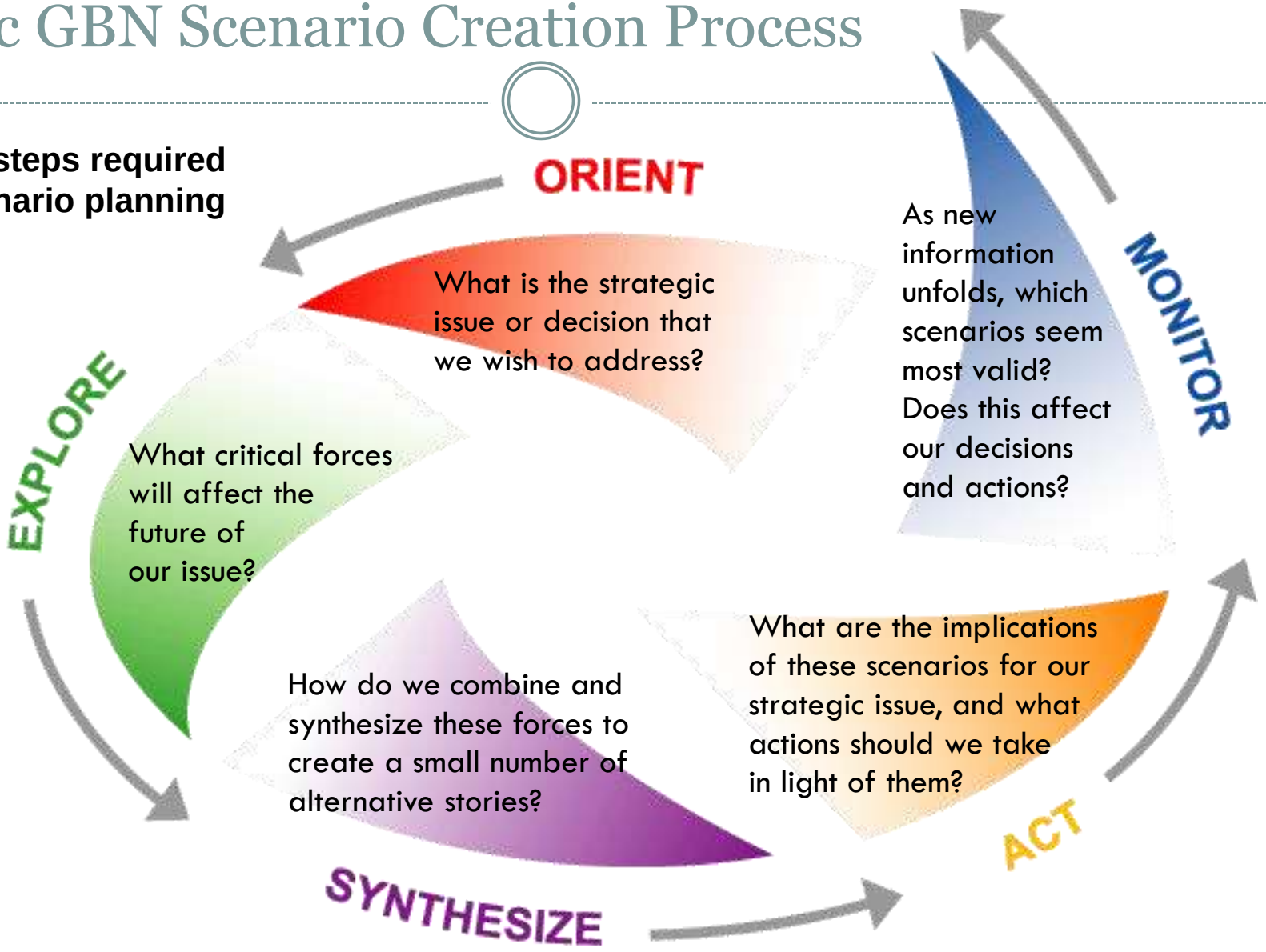
Part II:
Global Business Network (GBN) Scenarios Planning Process

STEPS IN SCENARIOS PLANNING:

- Orient
- Explore
- Synthesize
- Act
- Monitor

Explaining Scenarios: A Basic GBN Scenario Creation Process

The 5 key steps required in any scenario planning process



Step one: Orient

What is the strategic issue or decision that we wish to address?

How can NPS managers best preserve the natural and cultural resources and values within their jurisdiction in the face of climate change?

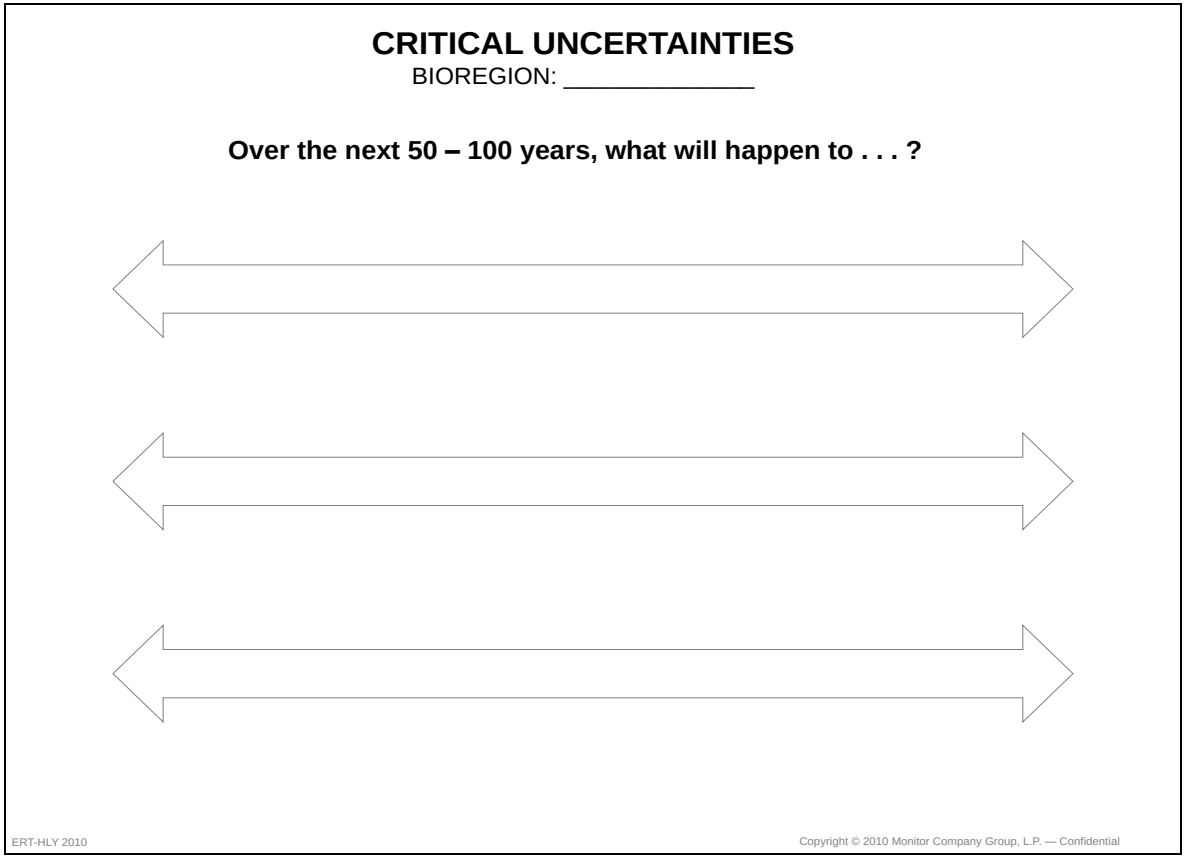
Gates of the Arctic National Park
photo credits: Tom Moran, Jay Cable, Amy Marsh

To answer this challenge, we need to explore a broader question:

How will climate change effects impact the landscapes within which management units are placed over the next 50 to 100 years?

Step Two: Explore

What **critical forces** will affect the future of our issue?



Critical forces generally have unusually **high impact** and unusually **high uncertainty**

Case Study: Coastal Parks, SWAN

Selected Drivers

Drivers as rated for certainty and importance by the Coastal group.

Climate Drivers (or, "Scenario Drivers based on Climate")	Uncertain	High certainty	Important
Temperature	X		X
Precipitation	X		X
Freeze-up		X	
Length of growing season		X	
Sea Level	X		
Water availability	X		
Relative Humidity	X		
Wind Speed (separate from Aleutian Low)	X (duration)	X (increase)	
PDO	X		
Extreme Events (temperature)		X	
Extreme Events (precipitation)	X	X	
Extreme Events (storms)		X	X

Additional drivers introduced by the group:

- Ocean Acidification
- Salinity (onshore/near shore)
- Aleutian Low
- Extreme Event (wind)
- AK Coastal Current

Selected drivers to explore:

Acidification: slight increase (-.1 pH) → major increase (-.4 pH) *Votes: 10*

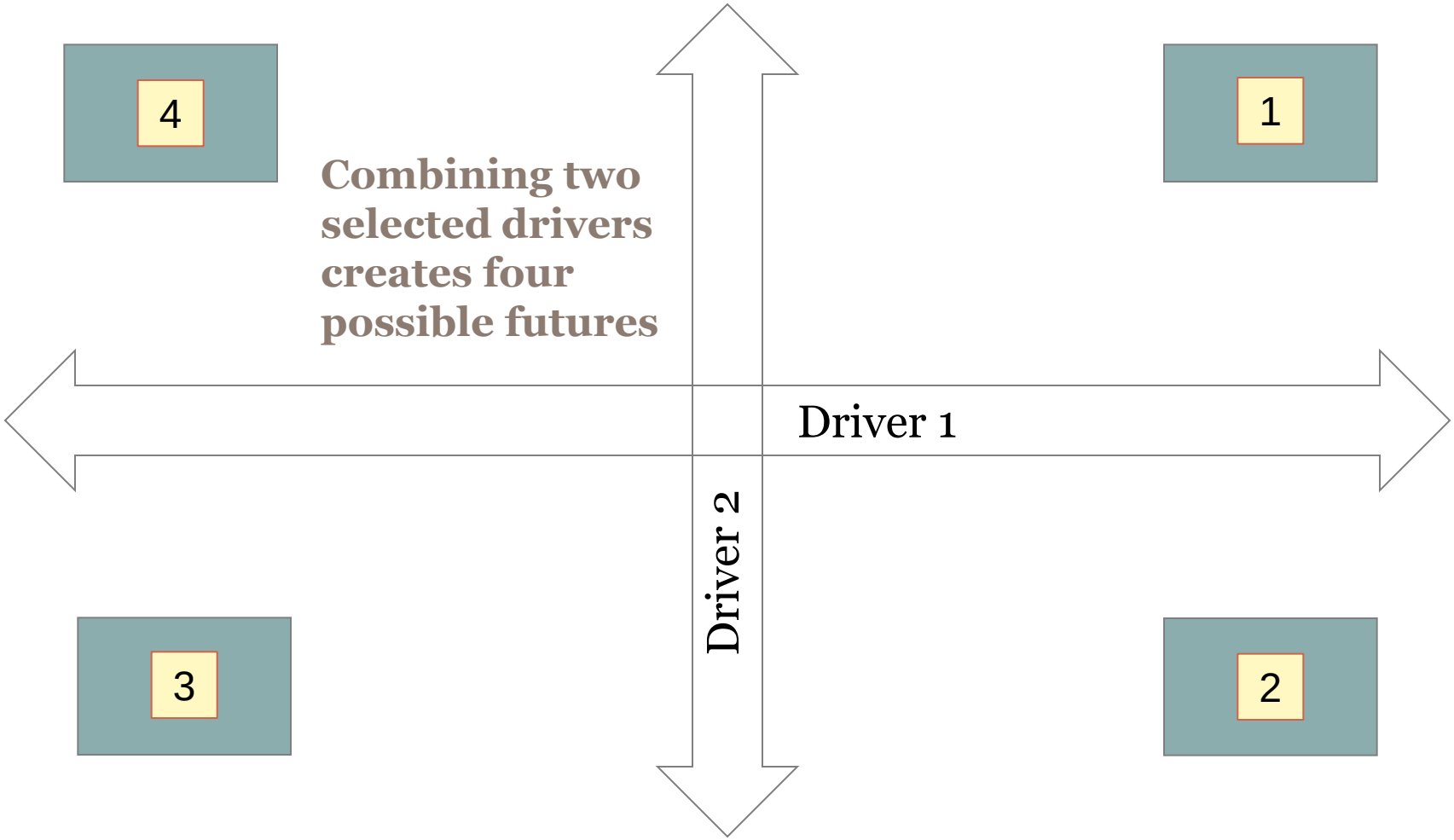
Temperature: +2 C by 2050/+3 C by 2100 → +4C by 2050/+6C by 2100. *Votes: 9*

Storms: No/slight change → Frequent (biannual pummeling). *Votes: 6*

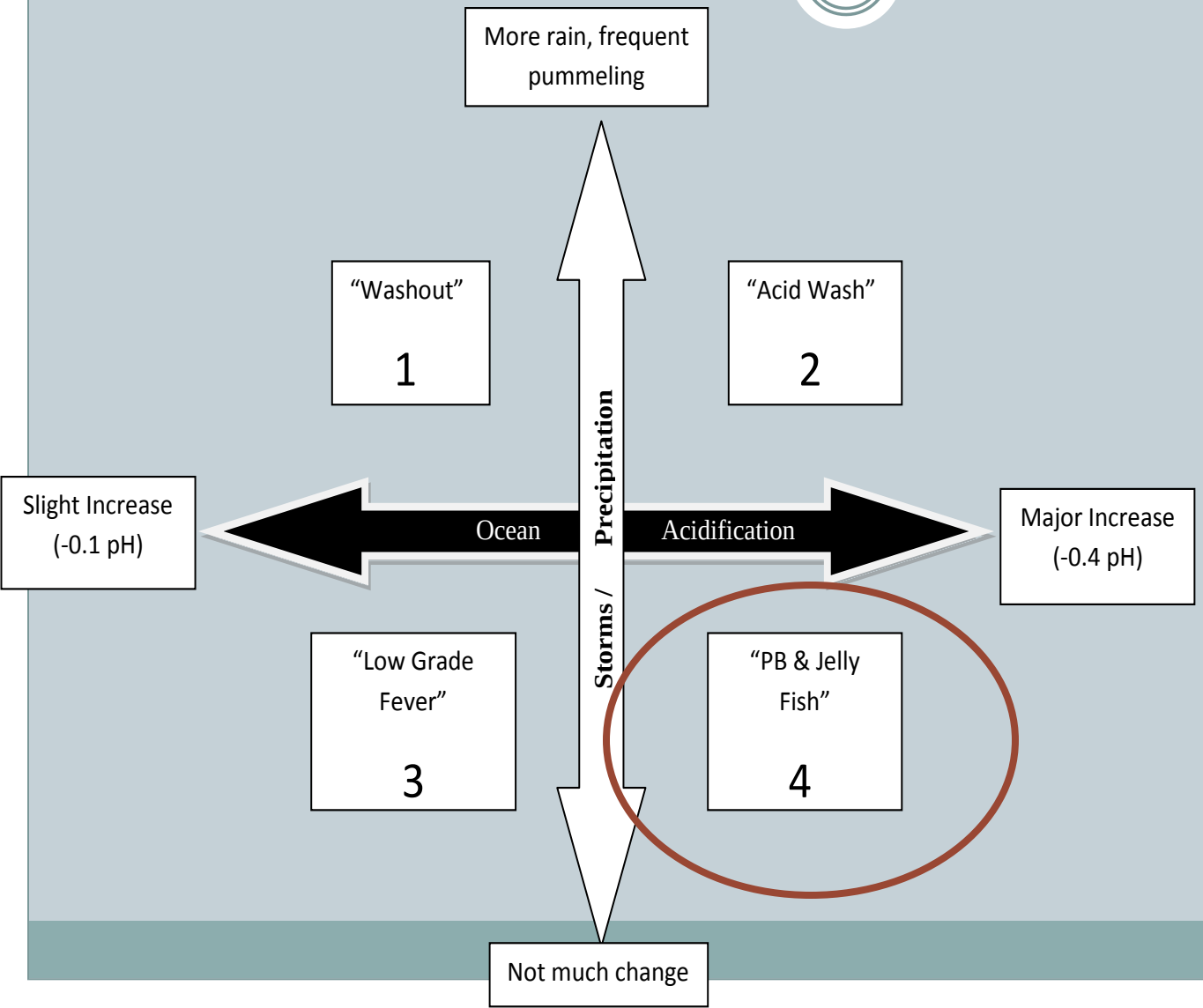
Precip (i.e., mean annual precip): same/some local decrease→ more rain, more total water. *Votes: 6*

CLIMATE SCENARIOS

BIOREGION: _____



Case Study: Climate Scenarios



Matrix showing the intersection of changes in storms and precipitation and changes in ocean acidification, as each pertains to coastal regions. Each quadrant yields a set of future conditions which are plausible, challenging, relevant, and divergent.

Case Study: Climate scenarios 1&2

"Washout"

- changes to habitat (influx of salt water)
- trail /road washout
- regular riparian disturbances
- more dynamic/changing coast leading to erosion
- larger floodplain and wetland
- less appealing destination
- destruction of cultural resources due to coastal erosion (communities/ facilities)
- possible need to relocate communities

"Acid Wash"

- ecotourism crash
- removal of biota (fish, birds, sea mammals)
- spawning areas destroyed
- subsistence/recreation opportunities changed
- coastal erosion
- catastrophic collapse of salmon
  - collapse of fishing (subsistence, sport, commercial)
  - collapse of community cohesion/culture
- destruction of cultural resources/infrastructure
- loss of clam/mussel habitat and marine mammals that rely on them
- requests from communities to intro species for subsistence/sport
- change in species composition (more deer?)
- possible need to relocate communities.

Case Study: Climate scenarios 3&4

"Low Grade Fever"

(note: temperature change dominates)

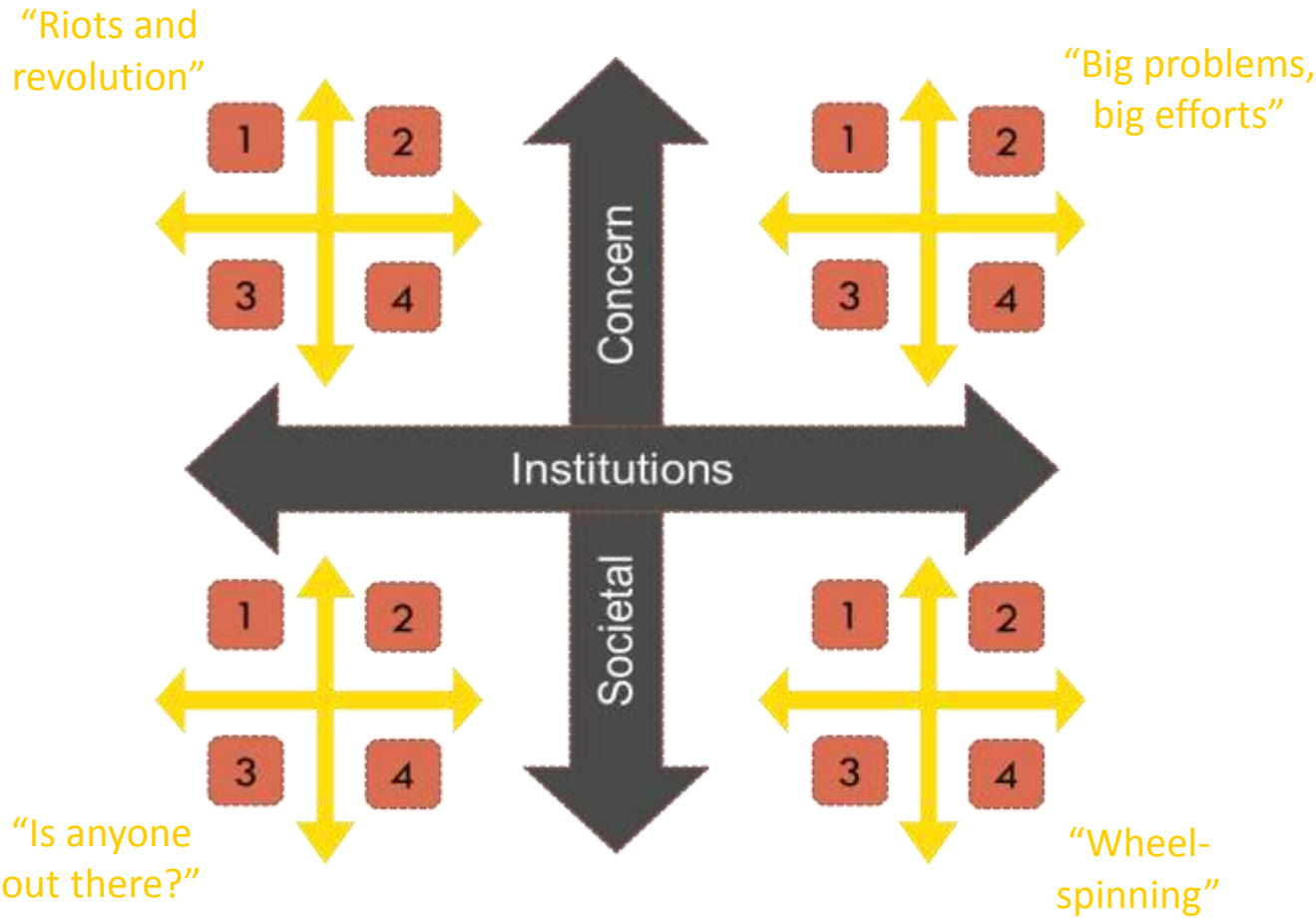
- increased drying of upland areas
- change in habitat (veg./animal composition)
- biomass may increase or decrease depending on location and veg.
- increased growing season
- less soil moisture
- increased glacial wasting?
- veg. expansion into deglaciated coastal areas
- redistribution of terrestrial mammals

"PB & Jelly Fish"

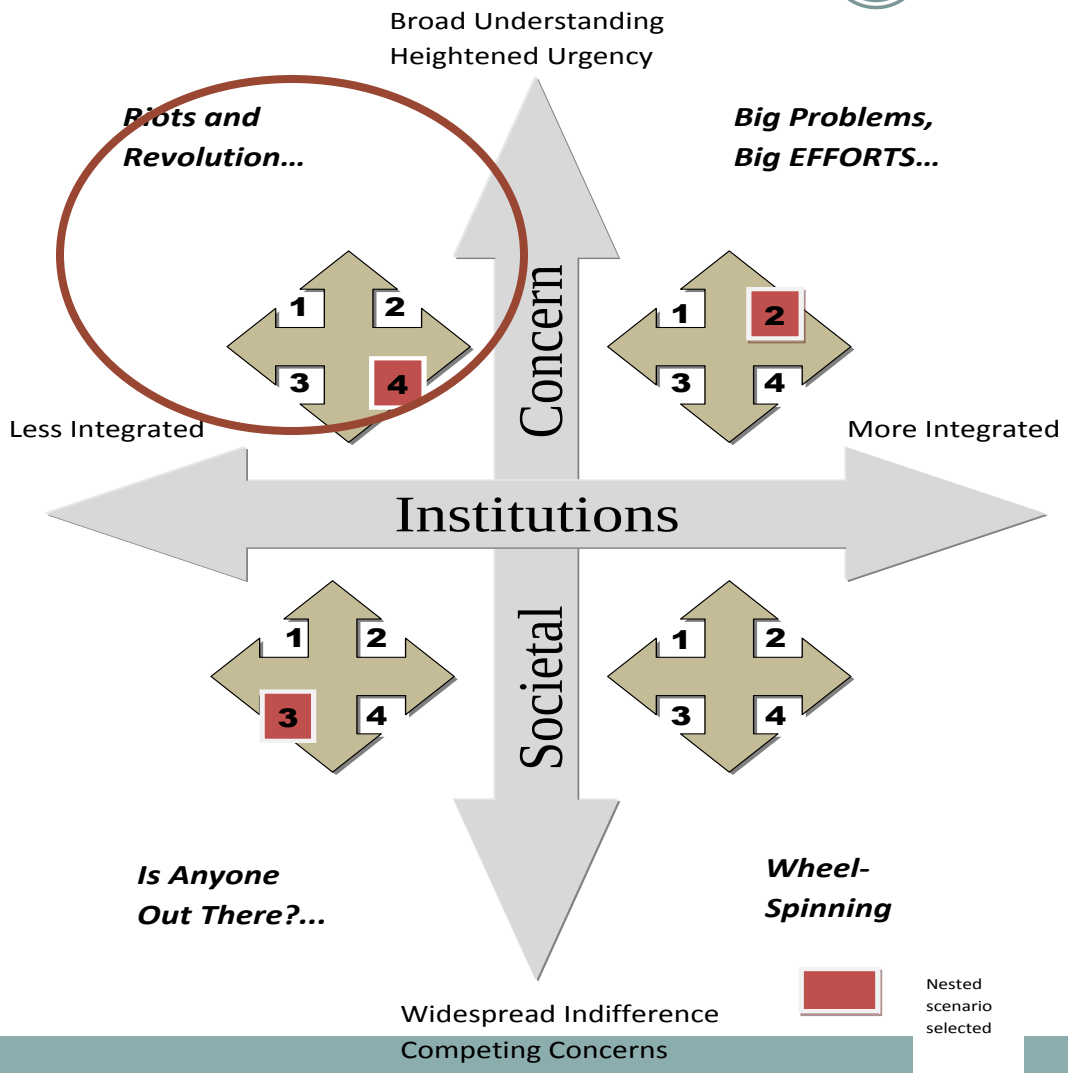
- loss of coastal species with exoskeleton →cascading effects for seabird populations and subsistence uses (both egg collecting and salmon)
- increase in jellyfish
- changes in fisheries (perhaps from salmon to tuna)
- type of change could shift appeal to visitors
- dramatic habitat change

"Nested Scenarios"?

Nesting each story in a social framework creates 16 possibilities:



Case Study: Nested Scenarios



Matrix showing Coastal climate scenarios nested in a social/institutional framework. Each quadrant yields four linked scenarios; three are selected in red.

Step Three: Synthesize

How do we combine and synthesize these forces to create a small number of alternative stories?

- Sixteen (or more) choices available (4x4)
- Need to select only 3-4 to turn into narratives and planning tools
- Focus on scenarios that are:
  - Relevant
  - Divergent
  - Plausible
  - Challenging
- Create a narrative (story) about each scenario

NESTED SCENARIO DETAILS

BIOREGION:_____

Socio-Political		Bioregion Climate

Describe This World in 2030

Major Impacts on the Bioregion

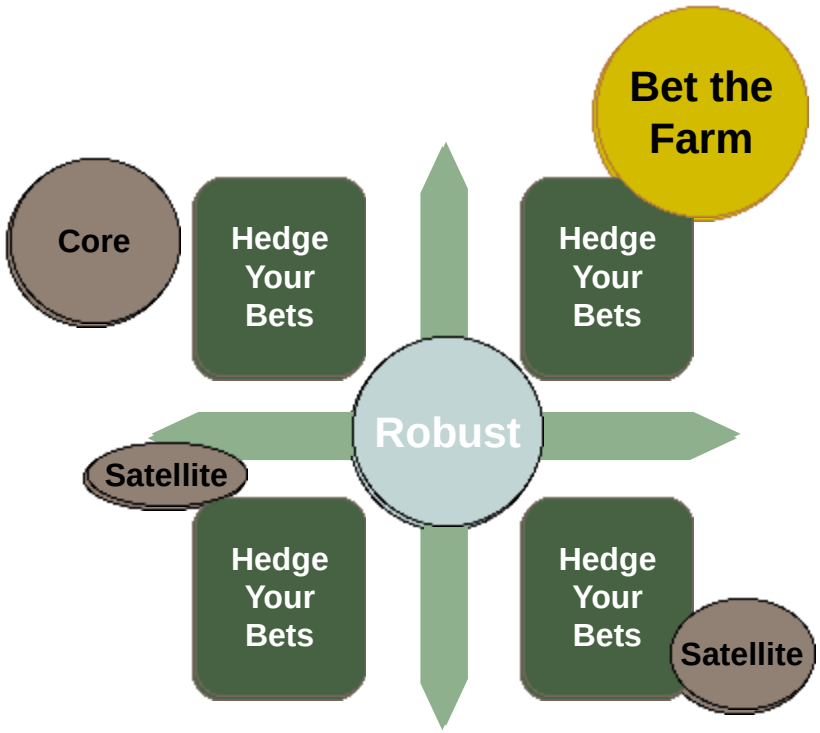
Issues Facing Management

Step 3: Synthesize

The 16 possible futures created in the preceding steps must be narrowed down to 3-4 scenarios that are relevant, divergent, challenging, and pertinent. Each has it's own narrative (story).

Step 4: Act

Categorizing Options to Help Set Strategy



Robust: Pursue only those options that would work out well (or at least not hurt you too much) in any of the four scenarios

OR

Bet the Farm / Shaping: Make one clear bet that a certain future will happen — and then do everything you can to help make that scenario a reality

OR

Hedge Your Bets / Wait and See: Make several distinct bets of relatively equal size

OR

Core / Satellite: Place one major bet, with one or more small bets as a hedge against uncertainty, experiments, and real options

Coastal Nested Scenario 1:
PB&J/Riots and Revolution: "Jellyfish Jamboree, Fishing Fiasco"
Implications

Natural Resources

- Pest and disease: increased parasite loads → marine mammals, ungulates
- Plant diseases: veg dieback
- PSP (paralytic shellfish poisoning) increase
- Glacial retreat or disappearance
- Veg shifts with impacts to ungulates: increased black spruce, woody upright veg (alder/willow)
- Major fisheries and ocean trophic restructuring
  - Failing: salmon, halibut
  - Gaining: unknown
- Invasives
  - Marine: range extensions from BC/WA of tunicates and green crab
  - Terrestrial: new invasives, rapid proliferation in distribution and diversity. Range extensions.
- Species of concern: migratory birds and marine mammals

Coastal Nested Scenario 1:
PB&J/Riots and Revolution: "Jellyfish Jamboree, Fishing Fiasco"
Implications

Cultural Resources

- Archaeological site loss
- Cultural disconnect of sacred or significant sites

Socioeconomic

- Oil and gas development: potential for mining, operational season changes
- Alcoholism and disease in people with dietary and social changes
- Decline and conflicts in commercial and sport fisheries/struggles with permitting and regulations for historic and or/emerging fisheries
- Village population declines w/ loss of subsistence and traditional economic base
- Reduced interest in marine wildlife viewing

Facilities

- Fire safe communities become a priority
- Changing priorities for facility funding as use patterns change and resource attractions shift location/
- Impacts on transportation options (overland, river boat, float plane access) due to loss of snow and ice

Coastal Nested Scenario 1:
PB&J/Riots and Revolution: "Jellyfish Jamboree, Fishing Fiasco"
Implications

Communication

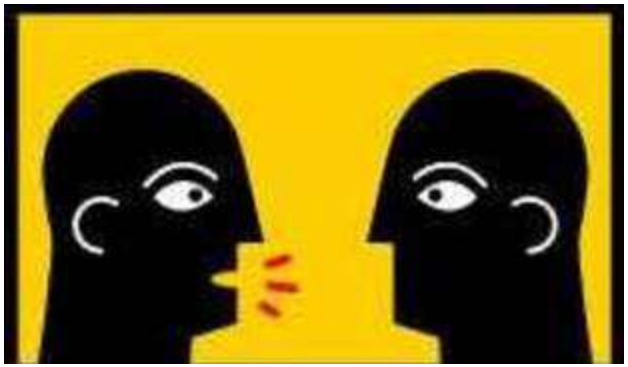
- Communications budgets cut; face-to-face interaction lessens
- Public demands info; managers unable to meet demands (lack of funding, decentralized info)
- Visitor (external audience)
  - Lack of changing venues to engage visitors
  - Fewer tour boat visitors
  - Poor access to glaciers
  - Bear viewing moved or diminished

Subsistence

- Loss/decline of traditional hunting species; some replacement species
- Increase in occurrence of paralytic shellfish poisoning: health impacts to local population
- Collapse of salmon in both maritime and riverine lifeways
- Plant/berry harvest: change in timing (phenology) and species
- Loss of language and traditions as local demographic changes (e.g. marine mammal customs and crafts)

The power of stories

Exxon Mobil, despite worldwide concern about the adequacy of the remaining supply of oil and the threat of global warming, maintains its public stance as a petroleum company.
BP has publicly proclaimed itself to be an Beyond Petroleum, "acting on the challenges of climate change, energy security, new sources of energy and our carbon footprint." (Forbes)



Stories embrace whole swaths of experience in one coherent sweep, and constitute an important way of knowing, thinking and feeling.

Stories have a unique power to contain and shape reality. The rationales given for wars and oppression are, in their essence, stories – but so too can be the rationales for positive change.

We are so embedded in stories and they in us that we are usually unaware of their power. ***Stories link us.***

(The Power of Story)

Case Study: Narrative

A phone conversation between Danny and his grandfather

--Hey Grandpa! How's it going?

--Oh, hi Danny. I miss you! How's life in Anchorage?

--Pretty good… I miss being able to go fishing with you, though -- even if we usually got nothing but jellyfish. Mom and Dad are just happy they have jobs again. I guess people still need interpretive rangers and port workers here.

--It was different twenty years ago, Danny. The fishing… well, you wouldn't believe how good the salmon fishing used to be. There were tons of mussels, and crabs, oysters, clams… you name it. Lots of visitors used to come to see the animals that fed on those fish, too.

--Yeah, that's what you always tell me. Mom and Dad say they used to see bears all the time, and tons of birds, and seals and otters and stuff. How come no one did anything about it when all those animals started to disappear?

--Well… it's hard to explain. We knew it was happening, but it was pretty tough to get the people with the power to do anything about it. They just weren't organized. There was a lot of arguing between the Council, and the Parks people, and the Fish and Wildlife people – all of those government folks. Some of them wanted to help, but they had no funding, and no plan. In the village, folks got depressed when they couldn't go fishing any more, and they felt like they just couldn't maintain their way of life.

--What about you, Grandpa? You're not depressed, are you? You should have moved to Anchorage with us!

--No, no, Danny. I'll stay here. I can't be a fisherman anymore, but there are still a few caribou worth hunting, and there might be a fish farm starting up. Maybe I could work there. Of maybe I can get an interview with that new oil and gas exploration company that is supposed to be moving into town soon. If the government isn't gong to help us, we just have to help ourselves, I guess.

Coastal Nested Scenario 1 (cont'd):
PB&J/Riots and Revolution: "Jellyfish Jamboree, Fishing Fiasco"

<u>Important Management Actions</u>

- Energy development—renewable village development
- Economic development (local and community ventures and employment)
- Partnerships with NGOs and community groups (LCCs, RACs, development groups, local gov't, native orgs)
- Convert to local resource use
- Streamline public engagement by issues rather than by jurisdiction
- Implement facility standards for green energy use and efficiency
- Provide forums for sharing scientific efforts and expertise

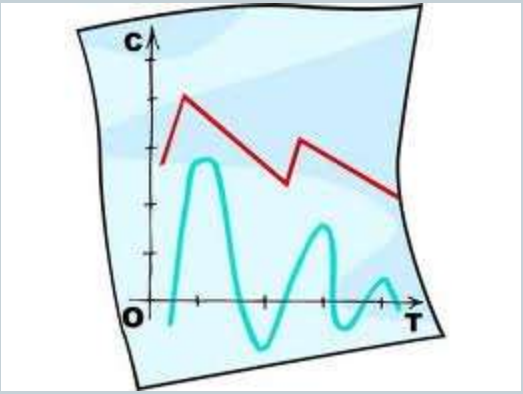
Coastal Nested Scenario 1 (cont'd):
PB&J/Riots and Revolution: "Jellyfish Jamboree, Fishing Fiasco"

Research and Information Needs

- Develop relevant communication strategies to feed into existing networks; assign accountability
- Resource monitoring: shared responsibility and protocols between communities and agencies
  - Water quality
  - Fish and wildlife populations
  - Invasive species
- Trophic interaction linkages research
- Ocean acidification research
- Facilitation of academic research with clearly communicated needs
- Economic/energy development: emphasize mitigation options and build planning (NEPA) capacity

No regrets actions: data, research and monitoring

1. Create seamless data sets
2. Collaborate with researchers and monitoring programs to track changes in PDO and ocean acidification
3. Increase fluidity and connections between research and monitoring
4. Conduct coastal/marine/onshore ecosystem monitoring



No regrets actions: collaboration and outreach

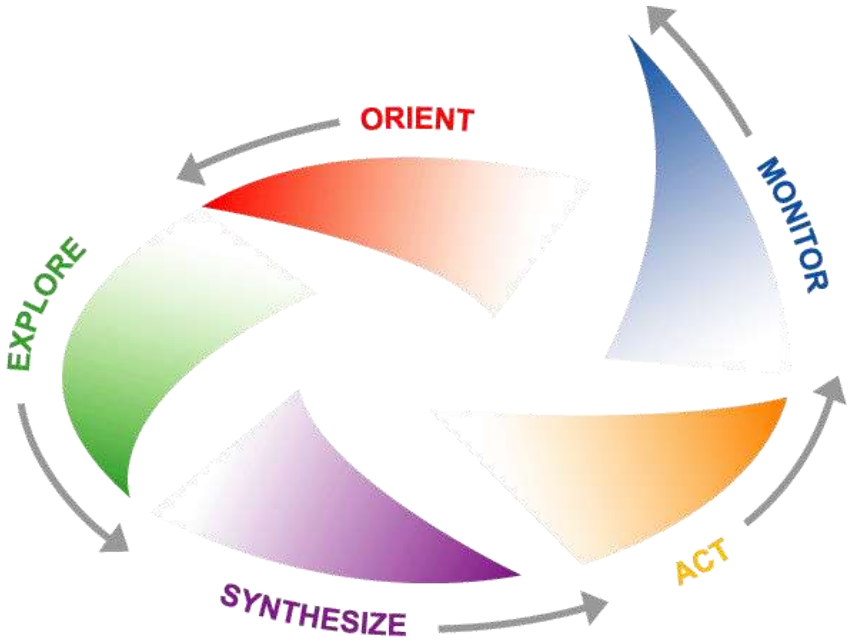
1. Coordinate communication with other agencies
2. Get missing players to the climate change scenario table at subsequent meetings
3. Provide science outreach and education to multiple audiences
4. Identify and cooperate with private/public entities for partnerships
5. Re-imagine how institutions can work together to solve common problems.

No regrets actions: flexibility and innovation

1. Tune planning process to account for multiple possibilities
2. Model, collaborate and promote energy efficient technologies
3. Create portable, flexible structures

Next Steps

The scenario planning process doesn't end with "SYNTHESIZE"



Teleconferences and webinars to confirm results and fill in gaps

Discussion of how to turn plans (no regrets management actions) into concrete actions

Development of outreach tools and information, including final report

Dissemination of scenarios and explanations of the process and results to a broad audience

Feedback from a wider audience

Linkages with planning for other park networks